

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

Form Approved  
OMB No. 0704-0188

REPORT DOCUMENTATION PAGE

1a. F <b>AD-A215 554</b>	1b. RESTRICTIVE MARKINGS <b>HC</b> <b>CTE</b> <b>181000</b> <b>D</b>	
2a.	DISTRIBUTION/AVAILABILITY OF REPORT Unlimited distribution Approved for public release	
2b. DECLASSIFICATION	8	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Research Institute of Environmental Medicine	6b. OFFICE SYMBOL (if applicable) SGRD-UE-HR	7a. NAME OF MONITORING ORGANIZATION U.S. Army Medical Research and Development Command
6c. ADDRESS (City, State, and ZIP Code)	7b. ADDRESS (City, State, and ZIP Code) Fort Detrick, Fredrick, MD 21701-5012	
8a. NAME OF FUNDING / SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (if applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO.      PROJECT NO.      TASK NO.      WORK UNIT ACCESSION NO.	
11. TITLE (Include Security Classification) Children in extreme environments		
12. PERSONAL AUTHOR(S) Lawrence E. Armstrong, Ph.D.		
13a. TYPE OF REPORT manuscript	13b. TIME COVERED FROM Aug 89 TO Aug 89	14. DATE OF REPORT (Year, Month, Day) 1989 August 17
15. PAGE COUNT 2		
16. SUPPLEMENTARY NOTATION		
17. COSATI CODES FIELD      GROUP      SUB-GROUP	18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) preadolescents, physiological responses, hot environments, cold environments, water immersion, sweat rate, heat acclimatization, skin blood flow	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Preadolescents do not respond to extremely hot, or cold, environments in the same ways that adults do. This brief article is written in an "ask the expert" format, per request of the journal editor, to describe the physiological responses of children for the athlete, practitioner and researcher. This article describes the responses of children, in comparison to adults, during exercise in hot and cold environments, as well as during swimming. Brief explanations for differences between children and adults are given.		
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
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Q: Do prepubescent children respond differently from adults, when exposed to extreme environments?

A: Prepubescent boys and girls should not be expected to respond in the same way that adults do. In hot environments (air temperature greater than skin temperature), children who engage in continuous exercise or competitive physical activities lasting longer than 30 - 40 minutes have a greater risk of hyperthermia than adults. The following five factors may play a role in this relative heat intolerance.

1. Children produce more heat per pound of body weight than adults, when walking or running.
2. Children produce approximately 40 % less sweat per sweat gland.
3. Children have a greater surface area per pound of body weight than adults, and theoretically absorb more heat from the surrounding environment, when air temperature exceeds skin temperature.
4. Children have a lower maximal cardiac output (amount of blood pumped by the heart per minute) than adults; this limits maximal skin blood flow, which in turn limits maximal heat loss via convection.
5. The rate of heat acclimatization is slower in children than in adults.

In cold environments, children theoretically lose more heat than adults because of their relatively large surface area per pound of body weight. Hypothermia is especially significant in swimming because heat transfer in water may be over 25 times greater than in air. Heat loss is a function of body fat, and not the ability to constrict skin blood vessels, indicating that lean swimmers are at increased risk of hypothermia. Also, the youngest swimmers (age group 8 to 18 years) apparently have the fastest rate of heat loss in 68°F water, even though body fat generally decreases as children grow into adolescence.

Suggested Reading

1. Bar-Or, O. Climate and the exercising child--a review. International Journal of Sports Medicine 1:53-65, 1980.
2. Bar-Or, O. The child athlete and thermoregulation. In: Exercise and Sport Biology, PV Komi (ed.). Champaign, IL: Human Kinetics, 1982.
3. Sloan, RE and Keatinge WR. Cooling rates of young people swimming in cold water. Journal of Applied Physiology 35:371-375, 1973.

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